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UNIVERSITY OPPOSITION TO UNFETTERED RESEARCH: A NEW BEDFELLOW FOR BIOTECH?

Katherine L. Record[†]

ABSTRACT

This Article examines university opposition to a proposed statutory exemption to infringement liability for basic genetic research and patient care. Gene patenting has allowed patentees to bar basic genetic research, slowing the progress of developing and administering diagnostics and gene-targeting therapeutics. Debates over the merits of gene patents have been heated, most recently leading to an unprecedented invalidation of several broad patents covering all variations and use of two genes linked to breast and ovarian cancers. More important, however (as this ruling was reversed in part), are proposed statutory exemptions to infringement liability. The Department of Health and Human Services' Secretary's Advisory Committee on Genetics, Health, and Society (SACGHS) has promulgated an exemption from liability for infringement that occurs in the course of research. This exemption would promote basic research by granting academic scientists unfettered access to genetic material. The proposal does not alter the patentability of gene sequences; it merely restricts patentees from using infringement threats to stop research.

Surprisingly, the Association of University Technology Managers (AUTM), an organization responsible for promoting development of university research, opposes such an exemption. The AUTM alleges that the exemption would slow research by reducing the incentive for private firms to invest in upstream discoveries made in university laboratories. Yet the exemption would do the opposite: by opening the doors to research relating to any gene segment, a research exemption would accelerate basic research. Moreover, it would not affect

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collaboration with private industry: where there is potential to commercialize basic research, biomedical companies would continue to license the rights to university discoveries. Thus, the AUTM's motivations in opposing the proposed research exemption are suspect. They appear to reflect either a misunderstanding of the purpose behind granting property rights to publicly funded university research, or an improper alignment with industry goals.

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INTRODUCTION

Our genetic makeup is far too complicated for a single entity to hold the keys to any given gene and to be able to choose when, if ever, to share.¹

Gene patenting has created great controversy since its inception only two decades ago. Exclusive rights over strands of nucleotides allow patentees to bar basic research on small but critically important sequences of the genome, creating logjams in genetic research and

¹ Joseph Stiglitz & John Sulston, *The Case Against Gene Patents*, WALL ST. J., Apr. 16, 2010, at A19.

slowing the progress of developing and administering diagnostics and gene-targeting therapeutics. Debates over the merits of gene patents have been heated, most recently illustrated by an unprecedented invalidation of several broad patents covering all variations and use of two genes linked to breast and ovarian cancers.² Although this ruling was reversed in part, it, along with the dissenting opinion to its reversal, demonstrates clear judicial recognition that the problems associated with gene patenting merit serious attention.

Fortunately, given the volatility in judicial treatment of gene patents,³ reducing the barriers to research and clinical care does not require judicial invalidation of gene patents. Rather, statutory exemptions to infringement liability can, and have, ameliorated problematic uses of patent enforcement power. A recent proposal, put forth by the Department of Health and Human Services' Secretary's Advisory Committee on Genetics, Health, and Society (SACGHS), puts forth an exemption from liability for infringement that occurs in the course of research.⁴ This exemption would promote basic research by granting academic scientists unfettered access to genetic material. The proposal does not alter the patentability of gene sequences; it merely restricts patentees from using infringement threats to stop research.

Surprisingly, the Association of University Technology Managers (AUTM), an organization responsible for promoting the commercialization of basic research, opposes such an exemption. The AUTM alleges that the exemption would slow research by reducing the incentive for private firms to invest in upstream discoveries made in university laboratories. Yet the exemption would do the opposite: by opening the doors to research relating to any gene segment, a research exemption would accelerate basic research. Moreover, it would not affect collaboration with private industry: where there is potential to commercialize basic research, biomedical companies will continue to license the rights to university discoveries. Thus, the AUTM's moti-

² *Ass'n for Molecular Pathology v. USPTO (Myriad I)*, 702 F. Supp. 2d 181, 185 (S.D.N.Y. 2010).

³ *Compare id.* (reasoning that the USPTO's treatment of isolated DNA as patentable subject matter reflects nothing more than a "lawyers trick") *with Ass'n for Molecular Pathology v. USPTO (Myriad II)*, No. 2010-1406, 2011 WL 3211513, at *6-8 (Fed. Cir. July 29, 2011) (concluding that isolated DNA has a "distinctive chemical identity and nature" and is thus appropriately patent eligible subject matter) *and id.* at *75-76, *117-18 (reasoning that isolated DNA is "not materially different from ... native genes" and thus "analogous to the 'new mineral discovered in the earth,' or the 'new plant found in the wild'") (Bryson, J., concurring in part and dissenting in part) (citing *Diamond v. Chakrabarty*, 447 U.S. 303, 309 (1980)).

⁴ SEC'y'S ADVISORY COMM. ON GENETICS, HEALTH, AND SOC'Y, DEP'T OF HEALTH & HUMAN SERV'S, GENE PATENTS & LICENSING PRACTICES & THEIR IMPACT ON PATIENT ACCESS TO GENETIC TESTS 4 (2010) [hereinafter SACGHS Report].

vations in opposing the proposed research exemption are suspect. They appear to reflect either a misunderstanding of the purpose behind granting property rights to publicly funded university research,⁵ or an improper alignment with industry goals.

This article examines the challenges gene patenting has presented for basic research, the proposed exemption that seeks to ameliorate them, and the AUTM's unfounded objection to this proposal. Part I discusses why patents on gene sequences are unique, both in substance and source. The patentability of nucleotides and the fruits of university research are relatively recent innovations in U.S. law, and commercial rights to both are strictly limited in other nations. Part II discusses the chilling effect of unfettered enforcement power, as well as the recent invalidation of several notorious gene patents, and the Federal Circuit's divided response. Then, noting that judicial invalidation of gene patents was short-lived, Part III discusses statutory means of ameliorating problems caused by gene patents. In particular, it discusses the SACGHS' proposed exemption from infringement liability for the use of patented sequences in research. Finally, Part IV analyzes the AUTM's response to the SACGHS' proposed exemption. Finding that the AUTM's concerns are exaggerated and unfounded, it queries whether the AUTM's motivations in opposing the exemption reflect a misunderstanding of its implications or an improper alignment with the biomedical industry.

I. PATENTING GENE SEQUENCES: GRANTING EXCLUSIVITY OVER INFORMATION AS OLD AS TIME

*A generation ago, the prevailing wisdom was that the best way to assure full utilization of publicly-sponsored research results for the public good was to make them freely available to the public. Today, federal policy reflects the opposite assumption.*⁶

Treating gene sequences as patentable subject matter is not a foregone conclusion under the language of the Patent Act⁷ or the history of case law interpreting it. Additionally, because the isolation of

⁵ As afforded by the Bayh-Dole Act, 35 U.S.C. §§ 200–204 (2011). See *infra* Part I.B.

⁶ Rebecca Eisenberg, *Patenting Research Tools and the Law*, in INTELLECTUAL PROPERTY RIGHTS & THE DISSEMINATION OF RESEARCH TOOLS IN MOLECULAR BIOLOGY 6, 7–8 (1997), available at http://www.nap.edu/openbook.php?record_id=5758&page=6.

⁷ 35 U.S.C. §§ 1–376 (2011).

gene segments generally occurs in university laboratories, the dispute surrounding gene patents extends to the social utility of privatizing publicly funded research. This part briefly reviews the rationale behind the patentability of gene sequences, noting that criticisms of this rationale are ample and the state of the law is tenuous, as a recent court ruling illustrates. It then turns to the source of gene discoveries—academic research—to discuss why the patentability of publicly funded discoveries is itself unique and controversial.

A. Gene Sequences as Patentable Subject Matter

The discovery of gene sequences is a relatively new phenomenon in biomedical research; the first gene patent was issued in 1982.⁸ Thus, judicial interpretation of the Patent Act as it applies to genetic information is relatively recent, and increasingly controversial. Recognizing gene sequences as patentable subject matter over which owners have unfettered enforcement power has allowed patent owners to halt publicly funded research as well as diagnostic care, creating substantial frustration among patients, clinicians, and scientists, and leading to a recent unprecedented judicial limitation of these intellectual property rights.⁹

Patented gene sequences stretch the boundaries of intellectual property law because they provide exclusivity over “the most basic information,”¹⁰ rather than over “product[s] of human ingenuity.”¹¹ However, patentees argue that because a gene patent claims an isolated form of DNA, the resulting property right is tied to a sequence that is not naturally occurring (e.g., requires human intervention and is thus patentable subject matter).¹² Indeed, the Supreme Court has been clear that the bounds of patentable subject matter are to be construed

⁸ *Gene Patents and Global Competition Issues: Protection of Biotechnology Under Patent Law*, GENETIC ENGINEERING & BIOTECHNOLOGY NEWS (Jan. 1, 2006), <http://www.genengnews.com/gen-articles/gene-patents-and-global-competition-issues/1163/>.

⁹ See *infra* Part II.C.

¹⁰ Stiglitz & Sulston, *supra* note 1, at A19.

¹¹ *Diamond v. Chakrabarty*, 447 U.S. 303, 309 (1980).

¹² Patentable subject matter includes “any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof.” 35 U.S.C. § 101. The Federal Circuit’s conclusion that genes are chemical compounds, and thus not products of nature when isolated from other DNA, was critical to finding that gene sequences were patentable subject matter. *Amgen, Inc. v. Chugai Pharm. Co.*, 927 F.2d 1200, 1206 (Fed. Cir. 1991) (“A gene is a chemical compound.”); see also Roger D. Klein, *Gene Patents and Genetic Testing in the United States*, 25 NATURE BIOTECHNOLOGY 989, 989 (2007) (chronicling the patentability of genetic material).

broadly, so as to encourage economically productive efforts.¹³ Thus far, the U.S. Patent and Trade Office (USPTO) has treated isolated sequences as such, granting patents so long as they have not yet been claimed,¹⁴ are not obvious to one skilled in the “art” of genetics,¹⁵ and can be described in detail.¹⁶

Nonetheless, the patentability of gene sequences is both controversial and potentially fragile. The United States is unique in granting gene patent holders unlimited enforcement power; nearly every other high-income nation has tempered a gene patentee’s ability to constrain research or clinical care.¹⁷ The unfettered approach taken by the United States has created a multitude of problems, both in genetic research and patient care.¹⁸ In response, the District Court for the Southern District of New York recently invalidated seven broad patents claiming the composition and diagnostic use of two genes related to breast and ovarian cancers.¹⁹ Although the Court accepted the powerful arguments put forth by patient, clinician, and research advo-

¹³ *Chakrabarty*, 447 U.S. at 307 (quoting *Kewanee Oil Co. v. Bicron Corp.*, 416 U.S. 470, 480 (1974)).

¹⁴ A discovery must be novel to the relevant art in order for a patent to issue. 35 U.S.C. § 102.

¹⁵ A discovery must be non-obvious “to a person having ordinary skill in the art,” in order for a patent to issue. 35 U.S.C. § 103. This requirement may be of growing importance to the Federal Circuit. See *In re Fisher*, 421 F.3d 1365, 1379–82 (Fed. Cir. 2005) (Rader, J., dissenting) (arguing that the majority erred in using utility, rather than non-obviousness, to invalidate a patent on expressed sequence tags).

¹⁶ A discovery must be described in “full, clear, concise, and exact terms as to enable any person skilled in the art ... to make and use the same,” in order for a patent to issue. 35 U.S.C. § 112. The utility of a gene—its function as a protein-encoding piece of information—must also be disclosed in a claim. *Fisher*, 421 F.3d at 1379 (holding that a gene sequence is not patentable subject matter if its utility is not yet known).

¹⁷ The majority of high-income nations prohibit patents on medical processes and diagnostics. Leisa Talbert Peschel, *Revisiting the Compromise of 35 U.S.C. § 287(c)*, 16 TEX. INTELL. PROP. L.J. 299, 308 (2008) (describing prohibitions on medical process patents); Weldon E. Havins, *Immunizing the Medical Practitioner ‘Process’ Infringer: Greasing the Squeaky Wheel, Good Public Policy, or What?*, 77 U. DET. MERCY L. REV. 51, 70 (1999) (noting that diagnostics are not patentable in most other nations). Moreover, most limit the strength of patents by explicitly providing for the use of compulsory licensing to promote public health. SACGHS Report, *supra* note 4, at 81–87; see also JEROME H. REICHMAN WITH CATHERINE HASENZAH, UNCTAD—ICTSD PROJECT ON IPRS & SUSTAINABLE DEV., NON-VOLUNTARY LICENSING OF PATENTED INVENTIONS: HISTORICAL PERSPECTIVE, LEGAL FRAMEWORK UNDER TRIPS, AND AN OVERVIEW OF THE PRACTICE IN CANADA AND THE USA, 12 (2003) (noting that the United States’ lack of statutory authority to issue compulsory licenses is unusual).

¹⁸ See *infra* Part II.

¹⁹ *Myriad I*, 702 F. Supp. 2d 181, 185 (S.D.N.Y. 2010); see *infra* Part II.C.

cacy groups, the Federal Circuit reversed many of them (and the parties continue to appeal), reflecting the volatility of gene patenting.²⁰

B. Basic Research as Patentable Subject Matter

The patentability of gene sequencing is unique not only because of the naturally-occurring subject matter involved, but also because the discoveries claimed in a gene patent generally stem from publicly funded university research. The right to privatize products of publicly funded research is well established—and indeed predates the patentability of genetic material—but is just as controversial as gene patenting itself. This section turns to the law that affords universities ownership over the fruits of federally-funded work. While the validity of university-owned patents is not in question, the efficacy of this legislation in stimulating drug development is, at best, uncertain.

All recent genetic research is based, at least in part, on the fifteen billion dollar publicly funded Human Genome Project.²¹ Moreover, the basic research involved in identifying a given gene's potential diagnostic or therapeutic value is conducted in large part by publicly funded academic scientists.²² These researchers are able to patent this work under the Bayh-Dole Act (Bayh-Dole), enacted in 1980 to grant universities ownership over federally-funded discoveries.²³ Seeking to stimulate private investment in basic research, Bayh-Dole was intended to arm universities with exclusive rights over upstream developments that could be licensed to private industry for commercialization.²⁴ Since then, universities have secured thousands of patents²⁵ and entered into licensing contracts with the majority of the members of the Biotechnology Industry Organization.²⁶ Private industry has

²⁰ See *infra* Part II; John Conley & Dan Vorhaus, *Pigs Fly: Federal Court Invalidates Myriad's Patent Claims*, GENOMICS L. REP. (Mar. 30, 2010), <http://www.genomicslawreport.com/index.php/2010/03/30/pigs-fly-federal-court-invalidates-myriads-patent-claims>.

²¹ Nicholas Thompson, *Gene Blues: Is the Patent Office Prepared to Deal with the Genomic Revolution?*, WASH. MONTHLY, Apr. 2001, at 9, 14.

²² SACGHS Report, *supra* note 4, at 2 n.5 (noting that over half of basic research funding came from the federal government in 2006).

²³ 35 U.S.C. § 200 (2011).

²⁴ SACGHS Report, *supra* note 4, at 28; Michael A. Heller & Rebecca S. Eisenberg, *Can Patents Deter Innovation? The Anticommons in Biomedical Research*, 280 SCIENCE 698, 698 (1998); Klein, *supra* note 13, at 989.

²⁵ Klein, *supra* note 13, at 989.

²⁶ Letter from James C. Greenwood, President & Chief Exec. Officer, Biotechnology Industry Organization, et al., to Kathleen Sebelius, Secretary, U.S. Dep't of Health & Human Serv's 2 (Feb. 4, 2010),

invested in the commercialization of over one hundred drugs, vaccines, and in vitro devices initially developed in university laboratories.²⁷

Despite increased commercialization of basic research, it is not clear that Bayh-Dole has increased utilization of publicly funded research. Not only does public funding account for a large portion of “bench to bedside” developments (reducing the need for private investment in basic research),²⁸ but Bayh-Dole itself has also complicated basic research in five ways that appear to slow, and sometimes preclude, biomedical progress. First, patenting basic research has created overlapping claims to gene segments. Researchers must navigate through a “patent thicket” before performing work on a gene implicated by one or more claims.²⁹ Second, unfettered licensing freedom has resulted in universities exclusively licensing patented gene sequences. This has created monopolistic authority over several genes—which precludes research on, and testing for, gene mutations.³⁰ Third, exclusively-licensed gene patents have prohibited other university researchers from using basic nucleic acid sequences as research tools.³¹ Fourth, universities have allocated resources towards expensive litigation to enforce their exclusively licensed patents.³² Finally, under Bayh-Dole, researchers face conflicting sets of incentives from the patent and academic publishing systems. Once encouraged to disclose findings immediately in a peer-reviewed journal, researchers who seek to patent their findings must refrain from publish-

http://essentialmedicine.org/sites/default/files/archive/SACGHSSign-onletter2-4-2010final_000.pdf.

²⁷ *Id.*

²⁸ Public funding of biomedical research increased by over 20 billion dollars since the late 1970s, contributing to the increase in therapeutics and diagnostics brought to market. Klein, *supra* note 13, at 989.

²⁹ Heller & Eisenberg, *supra* note 25, at 699.

³⁰ The majority of diagnostic monopolies originate from university-owned patents. Letter from Ethan Guillen, Executive Director, Universities Allied for Essential Medicines, and David Watkins, Coordinating Committee Member, Universities Allied for Essential Medicines, to Arundee Pradhan, President, AUTM 2 (Mar. 17, 2010), http://essentialmedicine.org/sites/default/files/UAEM_AUTM_final%2020100317_0.pdf.

³¹ See, e.g., Arti K. Rai & Rebecca S. Eisenberg, *Bayh-Dole Reform and the Progress of Biomedicine*, 66 LAW & CONTEMP. PROBS. 289, 292–93 (2003) (noting that the patent on primate embryonic stem cell lines includes exclusivity over all human embryonic stem cell lines).

³² See, e.g., *Univ. of Rochester v. G.D. Searle & Co.*, 249 F. Supp. 2d 216 (W.D.N.Y. 2003) *aff'd*, 358 F.3d 916 (Fed. Cir. 2004) (granting defendant’s motion for summary judgment based on lack of written description and enablement after university filed infringement action against pharmaceutical company).

ing results until a claim is within a year of being filed with the USPTO.³³

There is substantial evidence that these five unexpected effects of Bayh-Dole have hindered research, contrary to the spirit of the legislation.³⁴ Indeed, Bayh-Dole provides that universities should license the rights to their patents without “unduly encumbering future research and discovery.”³⁵ Yet Bayh-Dole provides little oversight authority to ensure this occurs: the law does not restrict licensing agreements,³⁶ and the National Institutes of Health has little authority to interfere with a licensing agreement that appears to restrict access.³⁷ In other words, university patenting practices that encumber future research violate the principles behind Bayh-Dole, but are neither expressly prohibited nor actively deterred. Part II discusses the extent to which gene patenting has, indeed, hindered research.

II. THE EFFECT OF A GENE PATENT ON RESEARCH

*[T]he scope of patents on DNA sequences evolved from patents on gene-constructs encoding therapeutic proteins, to patents on DNA sequences including not only their therapeutic utility in encoding the protein, but also the application of the knowledge regarding a gene sequence in diagnosis and research.*³⁸

³³ Wesley M. Cohen & John P. Walsh, *Real Impediments to Academic Biomedical Research*, in 8 INNOVATION POL’Y & THE ECONOMY 1, 14 (Adam B. Jafee et al. eds., 2007).

³⁴ See *infra* Part II.

³⁵ 35 U.S.C. § 200.

³⁶ Federally-funded university research is not subject to the same licensing restrictions as are research developments that come out of federal agencies. For example, the Federal Technology Transfer Act of 1986 prohibits licensing an invention to private industry without public notice and a determination that the license will neither substantially limit competition nor create an unreasonable period of exclusivity. SACGHS Report, *supra* note 4, at 77-78.

³⁷ For example, the National Institutes of Health may exercise “march-in rights” and reclaim title to a patent if a patented invention is not being licensed in a way which furthers the goals of Bayh-Dole. Rai & Eisenberg, *supra* note 32 at 294. While march-in rights are not limited to being exercised under “exceptional circumstances,” the government will not own the patent until: (1) the Secretary of Commerce approves the NIH’s determination that seizure is necessary to promote the objectives of Bayh-Dole, and (2) the patentee has exhausted (and been unsuccessful in) an appeal of said determination. *Id.* at 293-94. These processes take years, and the NIH has never “marched-in” to seize a patent. *Id.* at 294.

³⁸ Birgit Verbeure, Gert Matthijs & Geertrui Van Overwalle, *Analyzing DNA Patents in Relation with Diagnostic Genetic Testing*, 14 EUR. J. HUM. GENETICS 26, 26 (2006).

Claims on gene sequences not only stretch the boundaries of patentable subject matter, but also slow basic research. Patentees have threatened potential or actual infringers with cease and desist letters, leading researchers and laboratories to abandon projects relating to patented genes. This section discusses how this activity, along with the use of diagnostic monopolies to prohibit clinicians from offering comprehensive testing services, has led to widespread frustration amongst scientists, clinicians, and patient advocates. Indeed, gene patents have hindered basic research so substantially that researchers have fostered a culture of acceptable infringement. Finally, this section turns to the recent invalidation of seven gene patents, a clear judicial recognition that untempered enforcement power currently afforded to gene patentees is problematic at best.

A. A Chilling Effect

Unfettered genetic research has the capacity to move quickly: the American College of Medical Genetics attributes what are “usually very rapid improvement[s]” to diagnostic tests to “the addition of new mutations or the use of new techniques by numerous laboratories that have accumulated samples from affected individuals over many years.”³⁹ Gene patents, however, limit this work, prohibiting all but a few laboratories from collecting patient samples, identifying new mutations, and refining the accuracy and scope of a given test. In other words, diagnostic monopolies not only hinder patient access,⁴⁰ but also preclude researchers from developing alternative or improved versions of a test.⁴¹ Two characteristics of gene patents deter research: (1) the high transaction costs associated with licensing the rights to a patented gene; and (2) the breadth of gene patents, which often encompass both the gene itself and the method of searching for unusual sequences.

³⁹ Am. Coll. of Med. Genetics Exec. Comm., *American College of Medical Genetics Position Statement on Gene Patents and Accessibility of Gene Testing*, 1 GENETICS MEDICINE 237 (1999), available at www.acmg.net/StaticContent/StaticPages/Gene_Patents.pdf [hereinafter ACMG Position Statement].

⁴⁰ Diagnostic monopolies hinder patient access when patentees do not accept all forms of insurance coverage. For example, Myriad did not allow its laboratories to accept Medicaid reimbursement, meaning that Medicaid beneficiaries could not access BRCA1 and BRCA2 tests without paying the 3,000 cost out-of-pocket. *More Harm than Good? Patenting Genes is Bad for Diagnosis*, ECONOMIST, Apr. 24, 2010, at 90–91.

⁴¹ See Klein, *supra* note 13, at 990; *More Harm than Good?*, *supra* note 41, at 91.

1. *Transaction Costs Associated with Licensing*

Although researchers can theoretically license the right to conduct research on a patented gene, the number of patents on various gene sequences has made this a practical impossibility for many scientists. Heller and Eisenberg have attributed the prohibitive transaction costs involved in licensing negotiations to four factors.⁴² First, parties from both public and private industry often have stakes in gene patents. Negotiating agreeable terms is complicated by the divergent motivations of these parties. Second, researchers in the public sector have limited bargaining power in negotiations with sophisticated private firms. Third, predicting the future value of a gene sequence in a later discovery is impossible, and each party is likely to overestimate its own prospective contribution. Finally, researchers must navigate through a “patent thicket” merely to find the patentee with whom to begin licensing negotiations. Patent owners can then demand reach-through license agreements on their sequences, guaranteeing them a royalty on every development that stems from research on those genes. A researcher seeking to use a gene segment on which multiple parties have claims would then have to negotiate with multiple private parties with varying commercial interests.⁴³

2. *Broad Patent Claims*

Gene patents are problematic for researchers because they are extremely broad: many claims cover all variations in a gene sequence, and association patents claim all methods by which one could look for new mutations.⁴⁴ In other words, diagnostic patents preclude any comparison of a patient’s DNA with a patented sequence.⁴⁵ Such broad patents on gene sequences have four implications for genetic research. First, association patents slow data collection by precluding unlicensed laboratories from testing patients for mutations of interest. Second, these patents impede others from improving a diagnostic test

⁴² Heller & Eisenberg, *supra* note 25, at 700.

⁴³ *Id.*

⁴⁴ See Verbeure et al., *supra* note 39, at 32.

⁴⁵ Klein, *supra* note 13, at 990. For example, Myriad owns BRCA1 and BRCA2, and the Miami Children’s Hospital Research Institute owns the gene causing aspartoacylase deficiency, or Canavan disease. See also Stiglitz & Sulston, *supra* note 1, at A19 (“Myriad had total control over the BRCA1 and BRCA2 genes since the 1990s. No other companies have been able to do research on the genes without Myriad’s permission.”); Verbeure et al., *supra* note 39, at 32; Gregory P. Lekovic, *Genetic Diagnosis and Intellectual Property Rights: A Proposal to Amend ‘The Physician Immunity Statute,’* 4 YALE J. HEALTH POL’Y L. & ETHICS 275, 288 (2004).

or expanding its scope. Third, claims on gene fragments encumber the development of multiplex testing and whole genome sequencing. Finally, gene patents obstruct any research that might implicate a claimed sequence, even as it relates to issues in which the patentee is ostensibly uninterested.

Association patents detract from research by slowing data collection. Gene patents allow patent owners to shut down extant testing, even that which was in place before the patentee filed its claim.⁴⁶ Patentees have used cease and desist letters to demand that clinicians either stop offering a diagnostic test or pay royalties for each test administered.⁴⁷ For example, the owner of the Duchenne muscular dystrophy gene patent, Thermo Fisher Scientific, forced university medical centers to stop testing patients for the disorder.⁴⁸ Athena Diagnostics, the exclusive licensee of the patented methods used to diagnose Alzheimer's disease, has prohibited other labs from offering the test.⁴⁹ Even the possibility of infringement is sufficient to shut down a laboratory: in a survey of university diagnostic laboratories, the College of American Pathologists found that 48 percent had stopped performing or developing a diagnostic because of potential infringement liability.⁵⁰

The second way in which gene sequence patents slow research is by impeding others from expanding on or improving a diagnostic test. Patentees cannot only stop unlicensed laboratories from using a patent-protected test, but also can block development of variations thereon. This precludes researchers from using verification testing to identify false positives or negatives in an extant test,⁵¹ as well as from developing variants to test different sample types. For example, the Miami Children's Hospital Research Institute not only used cease and desist letters to prohibit laboratories from testing for the Canavan gene, but also to stop any research relating to it, declaring that it

⁴⁶ Brendan Borrell, *Lawsuit Rekindles Gene-Patent Debate*, 436 NATURE 413 (2010).

⁴⁷ Amy Dockser Marcus, *Licenses Drive Gene Debate*, WALL ST. J., (Apr. 15, 2010), [available at](http://online.wsj.com/article/SB10001424052702303348504575184103022053956.html) <http://online.wsj.com/article/SB10001424052702303348504575184103022053956.html>.

⁴⁸ *Id.*

⁴⁹ SACGHS Report, *supra* note 4, at 21, 32, 41, 56.

⁵⁰ Lekovic, *supra* note 46, at 291.

⁵¹ *Talk of the Nation: Breast Cancer Gene Patents Challenged* (NPR radio broadcast Dec. 11, 2009) (transcript available at <http://www.npr.org/templates/transcript/transcript.php?storyId=121343433>) (interviewing Daniel Ravicher, Executive Director of Public Patent Foundation).

would “enforce vigorously” its patents.⁵² Evidence of such impediments is not merely anecdotal: systematic review of the number of academic publications relating to continued research on patented genetic sequences reveals that gene patents are strongly associated with decreased follow-on research.⁵³ Moreover, a survey of laboratory researchers found that almost 50 percent have avoided test development out of fear of an infringement action, and 25 percent have abandoned an already developed test.⁵⁴

Third, gene patents have slowed research by hindering the development of multiplex testing and whole-genome sequencing. Multiplex testing offers patients several diagnostic services at once, and thus implicates a multitude of potentially patented sequences.⁵⁵ Similarly, whole-genome sequencing will soon allow clinicians to examine all of a patient’s genetic material, potentially looking for every identifiably harmful mutation in one sweep⁵⁶—and implicating “hundreds or thousands of patents already issued and exclusively licensed gene by gene.”⁵⁷ To develop either type of test without infringement, a researcher must negotiate and agree to royalties on any number of patented gene sequences. The resulting test might be more expensive than the cumulative cost of each individual diagnostic.⁵⁸ In other words, gene patents may eliminate the efficiencies offered by multiplex or whole genome sequencing. The only alternative to such expensive negotiations is to conduct comprehensive testing at the risk of facing an infringement suit. Emory University, for example, offers “chromosomal microarrays,” tests that detect a number of chromoso-

⁵² Lekovic, *supra* note 45, at 292 (quoting Complaint at ¶ 30, Ex. A, *Greenberg v. Miami Children’s Hosp. Research Inst.*, 208 F. Supp. 2d 918 (N.D. Ill. 2002)).

⁵³ SACGHS Report, *supra* note 4, at 2, 27 (citing Kenneth G. Huang & Fiona E. Murray, *Does Patent Strategy Shape the Long-Run Supply of Public Knowledge? Evidence from Human Genetics*, 52 ACAD. MGMT. J. 1193 (2009) (presenting empirical evidence of an inverse relationship between patents and follow-on research on a particular gene and concluding that patent ownership “fragmentation is ... problematic for follow-on contributors to the public knowledge stream [and] ... the negative effect of patents on follow-on public knowledge production is greatest for genes closely linked to human disease”).

⁵⁴ Thompson, *supra* note 22, at 14.

⁵⁵ SACGHS Report, *supra* note 4, at 12; Andrew Pollack, *After Patent on Genes Is Rejected, Taking Stock*, N.Y. TIMES, Mar. 31, 2010, at B1.

⁵⁶ Marcus, *supra* note 48.

⁵⁷ *Id.* (quoting Robert Cook-Deegan, Director of the Center for Genome Ethics, Law & Policy); see also *More Harm than Good?*, *supra* note 41, at 91 (“[G]ranting patents on individual genes ... leads to ‘fragmented ownership of the genome’ that will interfere with the progress of whole-genome sequencing.”).

⁵⁸ SACGHS Report, *supra* note 4, at 51-52 (noting that anticipated “royalty stacking” is likely to deter researchers from developing multiplex testing).

mal abnormalities, many of which occur on patented genes.⁵⁹ Some of the results the University reports to patients directly implicate patents for which Emory has not negotiated licenses.⁶⁰ Thus, according to the director of the medical-genetics department, “[e]verybody is a little bit nervous because of the legal situation of whether or not what we are doing would be viewed as infringement.”⁶¹ This approach is precarious: any given patent holder could effectively shut down the testing with an infringement action.⁶² Although the Supreme Court has hinted that a court may refuse to grant injunctive relief to a “hold-out” patentee who refused to agree to reasonable licensing terms, there is no guarantee that an infringement challenge to a multiplex test would be so resolved.⁶³

Finally, gene patents obstruct research that potentially implicates a claimed sequence, such as searching for a receptor site for a therapeutic or studying a rare disease associated with a patented fragment. In other words, gene patents preclude *all* unlicensed research on claimed segments, even those in which the patentee has no stake.

⁵⁹ Marcus, *supra* note 48.

⁶⁰ *Id.*

⁶¹ *Id.* (quoting David Ledbetter, Director of Emory University School of Medicine medical-genetics department).

⁶² SACGHS Report, *supra* note 4, at 52.

⁶³ The Supreme Court has hinted at—but not ruled on—the possibility that a court could appropriately prohibit a “holdout” patentee from demanding unreasonable royalties by refusing to grant said patentee injunctive relief from the defendant’s infringement. The Court eliminated the Federal Circuit’s bright line rule requiring injunctive relief upon showing of patent validity and infringement, but the intimation that damages would be appropriate in a holdout appears in a concurring opinion only, and is not sufficient to provide a multiplex test developer with assurance that a court would protect its continued existence. *See eBay v. MercExchange, L.L.C.*, 547 U.S. 388, 394 (2006) (“[T]he decision whether to grant or deny injunctive relief rests within the equitable discretion of the district courts, and . . . such discretion must be exercised consistent with traditional principles of equity. . . .”); *see also id.* at 396-97 (“An industry has developed in which firms use patents not as a basis for producing and selling goods but, instead, primarily for obtaining licensing fees. . . . When the patented invention is but a small component of the product the companies seek to produce and the threat of an injunction is employed simply for undue leverage in negotiations, legal damages may well be sufficient to compensate for the infringement and an injunction may not serve the public interest. . . .”) (Kennedy, J., concurring); *see also* SACGHS Report, *supra* note 4, at 52-53 (“[A] multiplex developer does not learn until after lengthy and expensive litigation is concluded whether an injunction will issue.”); Arti K. Rai, *Building a Better Innovation System: Combining Facially Neutral Patent Standards with Therapeutics Regulation*, 45 HOUS. L. REV. 1037, 1043 (2008) (arguing that the *eBay* decision has minimal implications for the biomedical arena, because courts are always likely to grant injunctive relief where the parties are competitors in the marketplace).

Because gene sequences “open the door to future discoveries,”⁶⁴ the scope of this limitation is indefinite. For example, therapeutic research requires screening multiple gene fragments as potential receptor sites, or using several expressed sequence tags to identify the genes that code for potentially therapeutic proteins.⁶⁵ A researcher who cannot negotiate the licenses to every patented segment or sequence tag must risk infringement, forgo testing patented receptor sites, or abandon the research all together.⁶⁶ Researchers are particularly likely to abstain from work on rare diseases that implicate patented sequences, as the cost of negotiating one or more licenses is often greater than the expected returns on the resulting diagnostic test or therapeutic.⁶⁷ For example, the president of Gene Dx, a company that develops diagnostics for rare genetic diseases, reports that he is least likely to seek the rights to develop testing for a disease linked to a patented gene.⁶⁸ Finally, patent owners can use reach-through license agreements to abort a licensee’s research that it views as unprofitable.⁶⁹ DuPont explicitly reserves this “veto power” in licensing terms that govern basic research using its genetically engineered mice.⁷⁰

B. A System of Rational Forbearance

The extent to which gene patenting interferes with basic research is substantial. To be sure, genetic research is only unfettered if gene sequences are widely licensed (e.g., the genetic sequence for cystic fibrosis)⁷¹ or placed in the public domain (e.g., the genetic sequence for Tay-Sachs).⁷² In contrast, where gene patents are exclusively licensed or not licensed at all, researchers and clinicians must—and

⁶⁴ Rebecca Eisenberg, *Re-examining the Role of Patents in Appropriating the Value of DNA Sequences*, 49 EMORY L.J. 783, 786–87 (2000).

⁶⁵ Heller & Eisenberg, *supra* note 25, at 699.

⁶⁶ *Id.*

⁶⁷ SACGHS Report, *supra* note 4, at 51.

⁶⁸ *Id.* at 30 (“Gene patents have a severe negative impact on the development, and thus the availability, of genetic testing for rare disorders. . . . I can assure the committee that any gene on which there is patent protection falls to the very bottom of my quite extensive list of genetic tests in which my company is interested.”).

⁶⁹ Heller & Eisenberg, *supra* note 25, at 699. A reach-through license agreement allows the patent holder to demand royalties or exert control over future discoveries made with the use of a patented gene sequence. Stephen G. Kunin, et al., *Reach-Through Claims in the Age of Biotechnology*, 51 AM. U. L. REV. 609, 618 (2002).

⁷⁰ *Id.* at 699–700.

⁷¹ Marcus, *supra* note 48; SACGHS Report, *supra* note 4, at 2.

⁷² SACGHS Report, *supra* note 4, at 21.

do—knowingly infringe patents.⁷³ Private industry rarely challenges this behavior; indeed, further research often increases the value of a patent at no cost to the patentee, and the use of cease and desist letters against university researchers generally tarnishes a company's reputation.⁷⁴ Still, where industry is commercially threatened (e.g., by an unlicensed laboratory offering a diagnostic test), it is quick to exercise its enforcement power to preserve exclusivity over the uses of a gene fragment. As discussed above, this has drastic consequences, both for research and patient care. In other words, researchers cannot rely on patentees exercising rational forbearance if their work may prove commercially valuable down the line. The most infamous enforcement example has led to the groundbreaking litigation of several patents covering two genes: BRCA1 and BRCA2.

C. Letting the “Gene Patent Horse Out of the Barn”⁷⁵

Research and clinical care problems stemming from gene patenting have long been flagged as untenable. Recently, the District Court for the Southern District of New York broke with precedent and invalidated two of the most notorious patents, striking down both composition and process claims⁷⁶ on the BRCA1 and BRCA2 genes.⁷⁷ The Federal Circuit reversed this invalidation in part, issuing a split decision reflective of the intensity of the controversy over gene patenting. This section reviews why these gene patents have stirred such controversy, and how both the district court and Federal Circuit treated them under the Patent Act. Because the decisions do not signal the end of gene patenting, the need for legislative remedies remains great.

Patents covering BRCA1 and BRCA2 have become infamous in the gene patenting debate: mutations on these genes are associated with increased risk for breast and ovarian cancers (60 and 15–40 per-

⁷³ John P. Walsh, Ashish Arora & Wesley M. Cohen, *Working Through the Patent Problem*, 299 SCIENCE 1021, 1021 (2003).

⁷⁴ *Id.*

⁷⁵ Conley & Vorhaus, *supra* note 21.

⁷⁶ Composition (or product) patent claims encompass rights to the gene sequence itself, while process patent claims encompass rights to the method of using the sequence as a diagnostic tool. See e.g., USPTO, MANUAL OF PATENT EXAMINING PROCEDURE: CHAPTER 2100 PATENTABILITY 2100-9 (8th ed. rev. 2007), available at http://www.uspto.gov/web/offices/pac/mpep/mpep_e8r6_2100.pdf.

⁷⁷ *Myriad I*, 702 F. Supp. 2d 181 (S.D.N.Y. 2010).

cent, respectively),⁷⁸ and early detection has substantial implications for prognosis and care.⁷⁹ The University of Utah Research Foundation owns seven broad patents on these genes, covering all sequence variations and diagnostic methods used on them.⁸⁰ Myriad Genetics, the exclusive licensee of these rights (and an offshoot of Utah's Center of Excellence Program),⁸¹ has actively used cease and desist letters to shut down any competing laboratory offering BRCA1 or BRCA2 screening, even those offering a test that Myriad does not perform.⁸² As a result, verification testing is not available and research focused on improving the tests has been eliminated (even though Myriad's version of the test has a twelve percent error rate).⁸³ Moreover, only a limited range of sample types may be tested,⁸⁴ and Myriad does not accept all insurance plans and has not been able to secure coverage by Medicaid in 50 percent of states.⁸⁵ Thus, many patients have not been able to access the tests, despite recommendations from their genetic counselors.⁸⁶ The breadth of these patents, and the problems they created, formed the ideal basis for a legal challenge to the validity of gene patenting itself, a USPTO practice that the medical profession has contested for years.⁸⁷

⁷⁸ *BRCA1 and BRCA2: Cancer Risk and Genetic Testing*, NAT'L CANCER INST. 2 http://www.cancer.gov/cancertopics/factsheet/Risk/Fs3_62.pdf (last reviewed May 29, 2009).

⁷⁹ *More Harm than Good?*, *supra* note 41, at 90; *see also* Borrell, *supra* note 47 (noting that BRCA mutations account for the majority of cases of inherited breast cancer).

⁸⁰ Borrell, *supra* note 47.

⁸¹ Myriad was established to commercialize research conducted at the University of Utah and has a close relationship with the institution. *Myriad Genetics, Inc.*, UNIV. OF UTAH TECH. VENTURE DEV. (Nov 18, 2005), <http://www.techventures.utah.edu/Documents/OtherCommercializationStories/Myriad.pdf>.

⁸² *Id.*

⁸³ *Id.*; Tom Walsh et al., *Spectrum of Mutations in BRCA1, BRCA2, CHEK2, and TP53 in Families at High Risk of Breast Cancer*, 295 JAMA 1379, 1386 (2006).

⁸⁴ Borrell, *supra* note 47.

⁸⁵ *Myriad I*, 702 F. Supp. 2d 181, 204 (S.D.N.Y. 2010).

⁸⁶ *Id.*

⁸⁷ The American Medical Association, the American College of Medical Genetics, and the College of American Pathologists each assert that broad gene patents run afoul of section 101. *See* Sherizaan Minwalla, *A Modest Proposal to Amend the Patent Code 35 U.S.C. § 287(c) to Allow Health Care Providers to Examine Their Patients' DNA*, 26 S. ILL. U. L.J. 471, 500–01 (2002) (quoting *ACMG Position Statement*, *supra* note 39). In 2007, a House bill proposed to expressly prohibit gene patenting. Genomic Research and Accessibility Act, H.R. 977, 110th Cong. (2007).

In *Association for Molecular Pathology v. U.S. Patent & Trademark Office*⁸⁸ (*Myriad I*), the District Court for the Southern District of New York invalidated both the composition and process patents covering the BRCA1 and BRCA2 genes, reasoning that genes are products of nature and thus beyond the scope of patentable subject matter.⁸⁹ The analysis behind this decision is notably different from other case law: the *Myriad I* Court rejected the premise that genetic material is a chemical that, when isolated, is “markedly different” from a gene existing in nature.⁹⁰ Rather, the Court concluded that gene sequences are strings of the same information—whether *in vivo* or *vitro*.⁹¹ On appeal, the dissenting judge on the Federal Circuit agreed, for the most part, with the district court’s reasoning, but the majority of the three judge panel did not, resulting in a reversal of most of the district court’s holdings. Notwithstanding the ultimate outcome of the case, which remains to be seen,⁹² the palpable tension between varying judicial interpretations of the patentability of genes reflects the malleability of patent law as it applies to the biopharmaceutical industry. Thus, analysis of both courts’ treatment of the validity of *Myriad*’s composition and process patents warrants analysis.

The district court narrowed the focus of analysis for the patentability of gene segments to § 101 of the Patent Act, whereas prior scrutiny had incorporated the novelty and non-obviousness requirements of §§ 102 and 103, respectively.⁹³ In other words, no court had explicitly held that patents on gene segments meet the threshold re-

⁸⁸ See *Myriad I*, 702 F. Supp. 2d at 181.

⁸⁹ *Id.*

⁹⁰ The defendants argued that an isolated gene is different from a naturally occurring gene because it is “substantially separated from other cellular components which naturally accompany a native human sequence [such as] human genome sequences and proteins.” *Id.* at 216 (alteration in original) (quoting U.S. Patent No. 5,693,473 col.19 1.6-15 (filed June 7, 1995)). The Court rejected this argument, finding that the “purification of a product of nature, without more, cannot transform it into patentable subject matter. Rather, the purified product must possess ‘markedly different characteristics’ in order to satisfy the requirements.” *Id.* at 227 (citing *Diamond v. Chakrabarty*, 447 U.S. 303, 310 (1980)).

⁹¹ *Id.* at 232; Pollack, *supra* note 56.

⁹² Both parties have filed petitions for a rehearing by the three judge panel. Defendant-Appellant’s Petition for Panel Rehearing at 11, *Myriad II*, 2011 WL 3211513 (Fed. Cir. July 29, 2011) (No. 2010-1406), 2011 WL 5057015 at *11; Plaintiffs-Appellees’ Petition for Panel Rehearing at 1, *Myriad II*, 2011 WL 3211513 (Fed. Cir. July 29, 2011) (No. 2010-1406), 2011 WL 5057016 at *1.

⁹³ *Amgen, Inc. v. Chugai Pharm. Co.*, 927 F.2d 1200, 1207 n.3 (Fed. Cir. 1991). The Federal Circuit has also examined gene patents under § 101, but has narrowed in on the utility element of that section. *In re Fisher*, 421 F.3d 1365, 1372 (Fed. Cir. 2005).

quirements of § 101 itself,⁹⁴ which the district court concluded do not.⁹⁵ The Federal Circuit, in a 3-2 decision, both agreed and disagreed. The majority adopted Myriad's arguments,⁹⁶ concluding that the act of cleaving DNA from its native source met the requirements of § 101, seemingly relying on the utility of the isolated genes in finding that the same nucleotide sequences could be "markedly different" from native DNA (e.g., pointing to protein synthesis and transgenic animals as fruits of manmade labor).⁹⁷ Although writing for the majority, Judge Lourie stood alone in this conclusion. Neither Judge Moore nor Judge Bryson, concurring and dissenting, respectively, adopted his reasoning that gene segments are patent eligible under § 101. Indeed, both declared Myriad's patent on DNA segments of fifteen or more nucleotides are not patent eligible, being distinct from native DNA in neither features nor utility.⁹⁸ Nonetheless, Judge Moore concurred in the opinion merely to preserve the property right expectations of patent holders.⁹⁹ In his dissent, Judge Bryson appropriately chided such reasoning, noting that there is no "collective right of adverse possession to intellectual property, and [the court] should not create such a right."¹⁰⁰ Indeed, Bryson harshly criticized the majority, noting that it improperly defers to the USPTO's Utility Exami-

⁹⁴ The Federal Circuit has not decided whether isolated DNA is an unpatentable product of nature under § 101 alone, although one judge has at least questioned the idea. *Intervet Inc. v. Merial Ltd.*, 617 F.3d 1282, 1293 (Fed. Cir. 2010).

⁹⁵ The *Myriad I* court concluded that DNA strands are "unpatentable products of nature" because the "defining characteristic of DNA" (information coding) is the same in both native and isolated forms. It went so far as to describe Myriad's contention that isolated DNA is "markedly different" from native DNA as a mere "lawyer's trick." *Myriad I*, 702 F. Supp. 2d at 185, 229.

⁹⁶ Amici analogized the *Myriad* case to *Diamond v. Chakrabarty*, 447 U.S. 303, 309-10 (1980) (holding that a man-made micro-organism is patentable subject matter because it is "a nonnaturally occurring manufacture or composition of matter—a product of human ingenuity 'having a distinctive name, character [and] use' and distinguishing the subject matter from un-patentable bacterium in part because of its 'potential for significant utility.'" (quoting *Hartranft v. Wiegmann*, 121 U.S. 609, 615 (1886))). See Brief for Rosetta Genomics, Ltd., et al. as Amici Curiae Supporting Defendants-Appellants, *Myriad II*, 653 F.3d 1329 (2011) (No. 2010-1406), 2010 WL 4853324, at *21-22; Brief for Univ. of New Hampshire School of Law as Amicus Curiae Supporting Defendants-Appellants, *Myriad II*, 653 F.3d 1329 (2011) (No. 2010-1406), 2010 WL 4853318, at *10.

⁹⁷ *Myriad II*, No. 2010-1406, 2011 WL 3211513, at *17 (Fed. Cir. July 29, 2011).

⁹⁸ *Id.* at *21 (Moore, J., concurring); *Id.* at *38-40 (Bryson, J., concurring in part and dissenting in part).

⁹⁹ *Id.* at *32 (Moore, J., concurring).

¹⁰⁰ *Id.* at *45 (Bryson, J., concurring in part and dissenting in part).

nation Guidelines (stating that isolated DNA is patentable subject matter),¹⁰¹ and mocking the reasoning behind the court's ruling:

[T]o argue that the isolated BRCA gene is patentable because in its native environment it is part of a much larger structure is no more persuasive than arguing that although an atom may not be patentable, a subatomic particle is patentable because it was previously part of a larger structure, or that while a tree is not patentable, a limb of the tree becomes a patentable invention when it is removed from the tree.¹⁰²

The district court's invalidation of the BRCA gene patents is significant, along with Judge Bryson's dissent to the Federal Circuit's reversal, even if both amount to no more than short-lived judicial acknowledgement of the substantial problems posed by gene patents.

Contrary to the rampant disagreement regarding Myriad's composition patents, both the district court and Federal Circuit invalidated its process patents as unpatentable abstract mental processes¹⁰³ under the Federal Circuit's "machine or transformation test."¹⁰⁴ If the Supreme Court hears the case, it will have to determine whether the Federal Circuit was correct to rely on this test, or whether it should have created a new (presumably more lenient) test as the Court recently insinuated would be appropriate in the context of "advanced diagnostic medicine techniques."¹⁰⁵ Unless the Court rules otherwise, however, judicial agreement in this context suggests stability with regard to the patent eligibility of diagnostic mental processes.

Regardless of the final outcome of litigation pertaining to gene patents, the research barriers associated with extant patents will persist. Thus, legislative solutions to these problems are critical. Part III

¹⁰¹ *Id.* at *44-45; *see also* USPTO Utility Examination Guidelines, 66 Fed. Reg. 1092, 1093 (Jan. 5, 2001).

¹⁰² *Myriad II*, 2011 WL 3211513, at *41 (Bryson, J., concurring in part and dissenting in part).

¹⁰³ *Myriad I*, 702 F. Supp. 2d 181, 185 ("[B]ecause the claimed comparisons of DNA sequences are abstract mental processes, they also constitute unpatentable subject matter.").

¹⁰⁴ *In re Bilski*, 545 F.3d 943, 954-55 (Fed. Cir. 2008) (holding that "the sole test" for determining whether a claimed process is patent-eligible under § 101 hinges on whether "(1) it is tied to a particular machine or apparatus, or (2) it transforms a particular article into a different state or thing.").

¹⁰⁵ *Bilski v. Kappos*, 130 S. Ct. 3218, 3227 (2010). Since this ruling, the Federal Circuit has not had the opportunity to elaborate on process patent tests except in the context of graphic design. *See Research Corp. Technologies v. Microsoft Corp.*, 627 F.3d 859, 867-68 (Fed. Cir. 2010).

examines two existing policies that have successfully addressed related issues, as well as a new proposal recently promulgated by the SACGHS.

III. A RESEARCH EXEMPTION: ALLOWING SCIENTISTS TO USE THE GENETIC INFORMATION BEFORE THEM

*Every scientific advance is built on those that came before it.*¹⁰⁶

The *Myriad* decisions reflect discontent with the limitations gene patents place on basic research and clinical care. Ameliorating these problems, however, does not necessarily require the elimination of gene patents. Indeed, since the Federal Circuit ruled that a patentee's enforcement power extends beyond commercial use of a patented process or product,¹⁰⁷ Congress has statutorily prohibited certain patentees from using threats of infringement liability to dampen research or clinical care. This section briefly describes those statutory exemptions from liability. It then turns to the SACGHS proposal, which would similarly limit a patentee's authority to slow basic research but would not alter the patentability of gene sequences. This proposed exemption is in line with existing laws—both in the United States and elsewhere—that are designed to promote rather than deter innovation,¹⁰⁸ and is ideal for universities seeking to conduct basic research and contract with private industry.

A. Existing Limitations on Patent Enforcement Power

Congress has created exemptions from liability for two classes of researchers and clinicians, limiting the extent to which exclusivity over a product or process can slow innovation or patient care.

¹⁰⁶ Stiglitz & Sulston, *supra* note 1, at A19 (Stiglitz, the 2001 Nobel Prize winner in economics, and Sulston, the 2002 Nobel Prize winner in medicine, both supported the American Civil Liberties Union and the Public Patent Foundation in their suit against Myriad Genetics and the University of Utah Research Foundation).

¹⁰⁷ *Madey v. Duke Univ.*, 307 F.3d 1351, 1362 (Fed Cir. 2002) (ruling that the “experimental use” common law defense to an infringement action is limited to actions performed for “amusement, to satisfy idle curiosity, or for strictly philosophical inquiry,” and does not include basic research) (quoting *Embrex Inc. v. Service Engineering Corp.*, 216 F.3d 1343, 1349 (Fed Cir. 2000)).

¹⁰⁸ REICHMAN, *supra* note 17, at 5-6, 11-12; Robert M. Portman, *Legislative Restriction on Medical and Surgical Procedure Patents Removes Impediment to Medical Progress*, 4 U. BALT. INTELL. PROP. L.J. 91, 92 (1996).

First, Congress has prohibited patent owners from seeking relief for infringement that occurs in preparation for seeking regulatory approval of a drug or medical device from the Food and Drug Administration (FDA).¹⁰⁹ This allows researchers to develop generic drugs during a pioneer drug's patent term, so that generics are ready for market immediately upon expiration of the pioneer patent.¹¹⁰ Because laboratory diagnostics are not subject to FDA regulations, diagnostic research is not similarly protected from infringement liability.¹¹¹

A second exemption shields medical providers from liability for infringement that occurs as the result of performing a medical or surgical procedure.¹¹² This exemption is narrow: it does not protect a provider from infringement liability for the use of a patented product or biotechnology process during the course of such a procedure. Therefore, a clinician is still not exempt from liability for performing a patented diagnostic test,¹¹³ although many have proposed such an extension.¹¹⁴

Neither of these narrowly tailored exemptions has deterred innovation, as opponents predicted each would. Instead, these exemptions have served to ameliorate problems associated with patent exclusivity, and serve as a model as legislators attempt to mitigate similar logjams stemming from gene patenting.

B. A Proposed Research Exemption

¹⁰⁹ The Drug Price Competition and Patent Term Restoration Act of 1984 (Hatch-Waxman Act) exempts research done in preparation for submission to the FDA from infringement liability. 35 U.S.C. § 271(e)(1) (2011) ("It shall not be an act of infringement to make, use, offer to sell, or sell within the United States or import into the United States a patented invention . . . solely for uses reasonably related to the development and submission of information under a Federal law which regulates the manufacture, use, or sale of drugs or veterinary biological products.").

¹¹⁰ See, e.g., *Schering-Plough Corp. v. Fed. Trade Comm'n*, 402 F.3d 1056, 1058 n.2 (11th Cir. 2005) (describing the abbreviated route by which Hatch-Waxman allows generics to come to market).

¹¹¹ SACGHS Report, *supra* note 4, at 12, 61.

¹¹² 35 U.S.C. § 287(c)(1) (2011).

¹¹³ *Id.* §§ 287(c)(2)-(c)(3).

¹¹⁴ A bill was introduced into the House in 2001, but failed to become law. See Genomic Research & Diagnostic Accessibility Act of 2002, H.R. 3967, 107th Congress (2002). The National Research Council and College of American Pathologists have advocated for such an exemption. SACGHS Report, *supra* note 4, at 97; *Gene Patents*, COLL. AM. PATHOLOGISTS (Aug. 31, 2004), http://web.archive.org/web/20041024182035/http://www.cap.org/apps/docs/advocacy/advocacy_issues/genes_patents.htm (accessed by searching for the original URL on Internet Archive) [hereinafter *CAP Gene Patents*]; Minwalla, *supra* note 88, at 500; Lekovic, *supra* note 46, at 296.

After analyzing the effect of gene patenting on genetic research, diagnostic quality, and clinical access, the SACGHS advised the Secretary of Health and Human Services to support, among other things,¹¹⁵ the legislative creation of an “exemption from patent infringement liability for those who use patent-protected genes in the pursuit of research.”¹¹⁶ The SACGHS identified this exemption as a potential solution to several of the barriers that gene patents create for research. This exemption not only opens the doors to unfettered basic research, but also is limited in scope; like the existing exemptions, it does not threaten the incentives patents provide for private investment in biomedical discoveries. Finally, the proposed exemption offers a very mild approach—when compared with the *Myriad* alternative—to the problems created by gene patents. From a university standpoint, the SACGHS’ proposed research exemption offers the best of two worlds: patented material is shared amongst researchers as if in the public domain, but new discoveries may still be privatized for commercialization.

The SACGHS recommended an exemption from liability for infringement of gene patents conducted in the course of research as a tenable solution to several of the barriers it identified. For example, patent owners would no longer be able to prevent unlicensed laboratories from offering diagnostic tests.¹¹⁷ Thus, competing laboratories could offer verification testing, creating a check on testing quality, and a patentee without a diagnostic could not strip the market of the availability of any test at all.¹¹⁸ Moreover, patent owners would not be able to “sit on” an extant diagnostic, as the licensee of the gene patents related to congenital long QT syndrome did for two years.¹¹⁹ Finally, researchers would not have to navigate patent thickets to license the right to perform further research on the diagnostic or therapeutic potential of a patented gene sequence. The American Medical Association, the American College of Medical Genetics, and the Col-

¹¹⁵ The SACGHS also recommended that the Secretary support an exemption from liability for all work pertaining to diagnostic tests used for patient care, promote adherence to non-exclusive licensing guidelines, increase transparency surrounding licensing agreements, establish an advisory board on gene patenting and health, provide advice to the Patent and Trade Office, and promote equal access to diagnostics. SACGHS Report, *supra* note 4, at 1-4.

¹¹⁶ *Id.* at 4, 97.

¹¹⁷ Klein, *supra* note 13, at 989.

¹¹⁸ SACGHS Report, *supra* note 4, at 83.

¹¹⁹ *Id.* at 3-4.

lege of American Pathologists have long advocated for a research exemption to promote progress in diagnostics.¹²⁰

While the proposed research exemption would open the doors to unfettered basic research on gene segments, it would not further limit the enforcement power behind a gene patent. Thus, for discoveries with potential commercial applications—such as therapeutics—universities could continue to attract private investment in the commercialization of a patented gene. Basic research on these genes, however, would continue without restraint. To the extent that this research produces an end product, incentive for private investment is not necessary.

Finally, the proposed research exemption is a very minor adaptation to the strength of a gene patent, particularly in light of the *Myriad I* alternative. Indeed, some argue that a research exemption for the infringement of gene patents is tantamount to the disclosure requirement imposed on all patent claims.¹²¹ Because gene sequences are nothing more than units of information, allowing unfettered use is arguably the only way to ensure that a gene patent does not fail the disclosure requirement by impermissibly “restrict[ing] the public from perceiving and analyzing information about the invention.”¹²² From a university standpoint, the SACGHS’ proposed research exemption offers an ideal balance: academic researchers would have unrestrained use of genetic material, while technology transfer offices would retain the ability to seek patents on the products of their research. Part IV examines the AUTM’s opposition to the proposed research exemption, and queries whether this resistance is misguided or reflective of profit-driven motives.

IV. UNIVERSITY OPPOSITION: MAINTAINING RESEARCH EXCLUSIVITY OVER GENETIC INFORMATION

*AUTM has sided with industry to take a position that will harm the interests of university researchers, not to mention the patients who need these genetic tests.*¹²³

¹²⁰ Minwalla, *supra* note 88, at 501; *ACMG Position Statement*, *supra* note 40; *CAP Gene Patents*, *supra* note 116.

¹²¹ Eisenberg, *supra* note 65, at 796–97.

¹²² *Id.* at 797.

¹²³ Press Release, Universities Allied for Essential Medicines, *UAEM Calls on AUTM to Retract Opposition to Panel Recommendations to Improve Access and Innovation in Field of Genetic Testing* (Mar. 17, 2010), <http://essentialmedicine.org/story/2010/03/17/uaem-calls-autm-retract-opposition-panel-recommendations-improve-access-and-innovat> [hereinafter *UAEM*].

The AUTM, along with several industry groups, has voiced strong opposition to each of the SACGHS' proposals to improve research on, and access to, diagnostics. The AUTM's resistance to any of the recommendations is worthy of analysis, but its hostility towards the research exemption is particularly striking, given the association's primary focus on "managing and licensing innovations derived from academic and nonprofit research."¹²⁴ This section argues that the AUTM's concerns with the proposed research exemption are exaggerated and unfounded, as the exemption would promote, rather than hinder, university research. After laying out the role of the AUTM, this section describes the Association's opposition to the SACGHS' proposed research exemption. It then argues that the AUTM's claims have little basis in reality and raise a red flag: either the AUTM misunderstands the purpose of Bayh-Dole, or it has adopted a misguided interest in securing rent-seeking licenses based on the fruits of academic researchers.

The AUTM is a network of academic technology transfer managers who seek to "[f]acilitate the commercialization of research [results] for the public good . . . [and] . . . [g]enerate [university] income and promote economic growth."¹²⁵ The organization takes substantial strides to exert its influence: although it denies lobbying, it actively "educates and communicates with public officials" on any subject related to university intellectual property rights (IPRs).¹²⁶ Facilitating unhindered research is a fundamental component of the AUTM's mission,¹²⁷ and it has twice confirmed its commitment to promoting ac-

¹²⁴ *About AUTM*, ASS'N U. TECH. MANAGERS, <http://www.autm.net/About/2185.htm> (last visited Apr. 10, 2010).

¹²⁵ *Id.*

¹²⁶ *See generally* Letter from the Advanced Med. Tech. Ass'n et al., to John Boehner, Speaker of the House of Representatives and Nancy Pelosi, Democratic Leader of the House of Representatives (June 13, 2011), <http://judiciary.house.gov/issues/Patent%20Reform%20PDFS/Mass%20Industry.pdf> (expressing AUTM's support for a proposed legislative provision that would allow the USPTO to retain all user fees); *see generally* Brief for Ass'n of Am. Univ. et. al. as Amici Curiae Supporting Petitioner, Bd. of Trustees of Leland Stanford Junior Univ. v. Roche Molecular Sys., Inc., 583 F.3d 832 (Fed. Cir. 2009) (No. 09-1159), 2010 WL 5385333, at *4 (arguing that Bayh-Dole prohibits a researcher from licensing a university's rights to an invention to a third party); *Gene Patents and Other Genomic Inventions: Hearing Before the Subcommittee on Courts and Intellectual Property of the House Committee on the Judiciary*, 106th Cong. 73 (2000) (prepared statement of James A. Severson, President, Cornell Research Foundation on Behalf of the AUTM).

¹²⁷ One of the AUTM's "[c]ore [v]alues" is that its work "benefits the public." *Mission and Goals*, ASS'N U. TECH. MANAGERS (July 22, 2009), http://www.autm.net/Mission_and_Goals/4253.htm.

cess to basic research. In 2007, the AUTM signed *In the Public Interest: Nine Points to Consider in Licensing University Technology*, a policy statement that asserts that researchers should not be subjected to infringement liability.¹²⁸ Two years later, the AUTM drafted a *Statement of Principles and Strategies for the Equitable Dissemination of Medical Technologies*, asserting that intellectual property rights must not be used as a barrier to the dissemination of university-developed research.¹²⁹

One day before the SACGHS released its *Draft Report on Gene Patents and Licensing Practices*, the AUTM—along with twenty-five members of the biopharmaceutical industry—sent a letter of “grave concerns” to the Secretary of Health and Human Services.¹³⁰ The letter strongly criticized the forthcoming SACGHS’ recommendations and predicted that their implementation would “seriously hamper public/private collaborations and the commercialization of publicly-funded research,” and “chill future investment and innovation.”¹³¹ The AUTM explicitly disapproved of the proposed research exemption, alleging that it would undermine “the value of gene-based patents.”¹³² It also attacked the merits of the SACGHS’ findings, alleging that the report is “based on claims of a crisis . . . that does not exist.”¹³³ It warned that “the recommendations, if implemented, would unravel . . . the patent system and the Bayh-Dole Act” and “do more harm to patients than good, by impairing the research, development and commercialization of the medicines and diagnostic tests of tomorrow.”¹³⁴

The AUTM’s opposition to the SACGHS’ proposed research exemption is unfounded and overstated: the proposed research exemption neither inhibits diagnostic progress nor removes the incentive for private investment in basic research. First, the exemption would al-

¹²⁸ Letter from Ethan Guillen & David Watkins to Arundee Pradhan, *supra* note 31, at 2.

¹²⁹ *Statement of Principles and Strategies for the Equitable Dissemination of Medical Technologies*, ASS’N U. TECH. MANAGERS, <http://www.autm.net/Content/NavigationMenu/TechTransfer/GlobalHealth/statementofprinciples.pdf> (last visited Apr. 20, 2010); Letter from Ethan Guillen & David Watkins to Arundee Pradhan, *supra* note 31, at 3.

¹³⁰ Letter from James C. Greenwood to Kathleen Sebelius, *supra* note 27, at 1.

¹³¹ *Id.* at 1–2.

¹³² *Id.* at 2.

¹³³ Letter from Ethan Guillen & David Watkins to Arundee Pradhan, *supra* note 31, at 2 (quoting Letter from James C. Greenwood to Kathleen Sebelius, *supra* note 27, at 3).

¹³⁴ Letter from James C. Greenwood to Kathleen Sebelius, *supra* note 27, at 3.

low university researchers to develop diagnostic tests without licensing with private industry. This is fully consistent with Bayh-Dole, enacted to attract private investment in basic research only where further commercialization is necessary to bring a development to market.¹³⁵ Because diagnostic tests are “often ready for use straight out of the lab . . . they do not require the patent ‘carrot’ to attract investment.”¹³⁶ Indeed, diagnostics are often entirely publicly funded and widely available long before a gene patentee develops a similar test.¹³⁷ Moreover, academic researchers who develop diagnostics report being motivated not by potential patents, but rather by the prestige, reputation, and career advancement that attach to break-through discoveries.¹³⁸ Players in the biomedical industry agree: the patentability of a future diagnostic serves as a “very minor motivational role, at best.”¹³⁹ Second, where further commercialization is necessary to bring a development to market, biomedical firms will continue to invest to develop therapeutics out of basic research, as the proposed exemption does not alter the patentability of genetic discoveries.

Indeed, the AUTM’s opposition to the proposed research exemption is alarming because the exemption offers universities the optimal arrangement. Arming academic researchers with unrestrained use of gene segments would heighten productivity—leading to increased output of diagnostics and potential therapeutics—and would not hinder a university’s ability to seek a patent and use it as a negotiating tool in the commercialization of basic research. Thus, the AUTM’s resistance to the SACGHS’ proposal appears to be motivated by one of two rationales. First, the AUTM may be misconstruing Bayh-Dole to promote private investment even where basic research is sufficient to produce an end product. This would be a blatant misconception: the law was unequivocally designed to encourage commercialization

¹³⁵ 35 U.S.C. § 200 (2011).

¹³⁶ *UAEM*, *supra* note 125.

¹³⁷ For example, tests for spinocerebellar ataxia, breast cancer, Canavan disease, familial long QT syndrome, and hearing loss were available before the eventual patentee of the related gene developed its own test. SACGHS Report, *supra* note 4, at 31; *see also More Harm than Good?*, *supra* note 41, at 91; Stiglitz & Sulston, *supra* note 1, at A19.

¹³⁸ Researchers responsible for discovering genes that cause Alzheimer disease, Tay-Sachs disease, and cystic fibrosis, all reported that their research in the area was motivated by these factors, rather than the potential of patenting their work. SACGHS Report, *supra* note 4, at 21 (quoting Katie Skeehean et al., *Impact of Gene Patents and Licensing Practices on Access to Genetic Testing for Alzheimer Disease*, 12 GENETICS MEDICINE S71, S77 (Supp. 2010)).

¹³⁹ *Id.* at 22 (interviewing pharmaceutical company executives, diagnostic testing laboratory directors, and representatives of the College of American Pathologists and the Wisconsin Alumni Research Foundation).

of basic research only where necessary to take a discovery from “bench to bedside.”¹⁴⁰ Second, if the AUTM has not misinterpreted Bayh-Dole, its position may reflect an imprudent alignment with private industry. This is alarming and a cause for concern. The AUTM cannot simultaneously cater to the conflicting objectives of for-profit and nonprofit institutions. Indeed, its alliance with industry in resisting a research exemption that would benefit academic researchers reflects that it may have already placed the former over the latter.

CONCLUSION

Gene patenting is steeped in controversy, largely because of the many complications it creates for scientists, clinicians, and patients. The stifling effect on basic research is one of the biggest problems stemming from current gene patenting practices: unchecked enforcement power behind a patent has allowed patentees to shut down any and all research relating to a claimed segment of DNA. This phenomenon, along with barriers to clinical care, has stirred great debate over the merits of gene patenting and how the strength of such patents might be tempered.

The recent partial invalidation, of two notorious gene patents—BRCA1 and BRCA2—is an unprecedented judicial response to the problems posed by gene patenting. Moreover, the differential reasoning and conclusions of each of the three judge appellate panel reflects flux and uncertainty regarding the validity of gene patents as a group. If nothing else, the disagreement within the Federal Circuit on the matter reflects the complexity of the problems in this area.

Regardless of the ultimate validity of gene patents, legislative solutions offer effective and modest modifications to the strength of gene patent that can ameliorate some of the problems associated with them. One such solution is the SACGHS’ recent proposal for an exemption from liability for infringement that occurs during the course of basic genetic research. This exemption would allow academic researchers unlimited use of all DNA sequences, but would not alter the patentability of related discoveries. Thus, it would increase the efficiency of basic research without detracting from a university’s ability to seek a patent and license the rights to a discovery that requires further commercialization.

Surprisingly, the AUTM opposes such an exemption. The AUTM alleges that the exemption would slow research by reducing the incentive for private firms to invest in upstream discoveries. On the con-

¹⁴⁰ Eisenberg, *supra* note 65, at 796.

trary, the exemption would not affect collaboration with private industry: where an academic discovery requires further commercialization, biomedical companies would continue to enter into licensing agreements with universities. Further, the exemption would open the doors to research relating to any gene segment, thus accelerating basic research.

The AUTM's motivations in opposing the proposed research exemption are suspect and appear to be based in either a misunderstanding of the purpose behind Bayh-Dole or an improper alignment with industry goals. Either is alarming, and would have negative implications for the management of the licensing of university innovations.